

Of the 20 claims pending, claims 1, 3, 4 and 12 are independent. Claim 1, in its present form, reads as follows:

1. A storage water used for storage of a silicon wafer in water, wherein the storage water contains Cu at a concentration of 0.01 ppb or less. [emphasis added]

Claim 3, in its present form, reads as follows:

3. A method of storing a silicon wafer in water, comprising the steps of preparing water or a chemical solution which does not cause degradation of oxide dielectric breakdown voltage due to copper contamination, and storing a silicon wafer in the prepared water or a chemical solution. [emphasis added]

Claim 4, in its present form, reads as follows:

4. A method of storing a silicon wafer in water, comprising the steps of preparing storage water containing Cu at a concentration of 0.01 ppb or less, and storing a silicon wafer in the prepared storage water. [emphasis added]

Claim 12, in its present form, reads as follows:

12. A method of storing a silicon wafer in a storage solution, comprising the steps of preparing water or a chemical solution containing a chelating agent, and storing a silicon wafer in the prepared water or chemical solution. [emphasis added]

As defined in claims 1, 3, 4 and 12, the present invention is characterized in that wafers are stored by using "storage water containing Cu at a concentration of 0.01 ppb or less" (claims 1 and 4), "water or a chemical solution which does not cause degradation of oxide dielectric breakdown voltage due to copper contamination" (claim 3), or "water or a chemical solution containing a chelating agent" (claim 12).

According to the features as set forth in claims 1, 3, 4 and 12, an object of the present invention is to provide silicon wafer storage water and a silicon wafer storage method which can prevent contamination during storage to thereby prevent degradation of oxide dielectric breakdown voltage (see lines 19-23 of page 5 of the specification), and the invention has the effect of preventing degradation of oxide dielectric breakdown voltage, which would otherwise occur due to contamination by Cu contained in storage water (see lines 5-9 of page 10 of the specification).

Regarding independent claims 1, 3, 4 and 12, the previous Office Action of March 1, 2001 stated that Hayashida et al. intrinsically discloses a similar solution that is used to treat silicon wafers, and Suzuki et al. intrinsically discloses a similar method in using water for storage of wafers. Therefore, claims 1, 3, 4 and 12 are obvious over Hayashida et al. in view of Suzuki et al., according to that Office Action.

In responding to this statement in the prior Office Action, applicant pointed out in the response of May 30, 2001 that the solution of Hayashida et al. is used only to treat a surface of a wafer, and is not used to store a wafer in storage water

(see paragraph 5 under "Applicants Arguments" on the sixth page of the Office Action of June 18, 2001). However, according to that Office Action, the patent of Suzuki et al. teaches the method of storing silicon wafers (see paragraph 5 under "Response to Applicants Arguments" on the seventh page of the Office Action of June 18, 2001), and therefore the present invention is obvious over Hayashida et al. and Suzuki et al.

However, as applicant pointed out in the response of May 30, 2001, the essential feature of Suzuki et al. is to store wafers in an aqueous hydrogen peroxide solution, and not to store them in highly purified water containing Cu at a concentration of 0.01 ppb or less or in water with an added chelating solution. If anything, Suzuki et al. teach away from storing wafers in water, except an aqueous hydrogen peroxide solution (see lines 50-61 of Col. 2, lines 14-26 of Col. 3 and lines 18-34 of Col. 5 of Suzuki et al.). Therefore, even the combination of the solution described in Hayashida et al. and the water storage method described in Suzuki et al. cannot lead to the present invention. In particular, and with regard to claims 1, 3 and 4, because both Hayashida et al. and Suzuki et al. do not describe the effect on oxide dielectric breakdown voltage due to contamination of Cu in the storage water and concentration of Cu, the combination of Hayashida et al. and Suzuki et al. cannot and does not lead one skilled in the art to the subject matter of claims 1, 3 and 4 of the present application.

In the response of May 30, 2001, applicant also noted that the cited references contain no description of the problem described at line 11 of page 3 to

line 4 of page 4 of the present application, that even if contaminants are removed from a surface of a wafer by cleaning, degradation of oxide dielectric breakdown voltage occurs when storing a wafer (see paragraph 6 under "Applicants Arguments" on the sixth page of the current Office Action). In this regard, the Office Action responds by stating that the claims are written in open language and do not preclude any additional elements or additional steps, and the claims read on the references as the Examiner has maintained (see paragraph 6 under "Response to Applicants Arguments" on the seventh page of the current Office Action). However, the claims of the present application do not read on Hayashida et al. or Suzuki et al. As previously noted, Hayashida et al. does not describe storage of a wafer in water having a Cu concentration of 0.01 ppb or less. Suzuki et al. specifies storage of a wafer in an aqueous hydrogen peroxide solution, but does not describe water having a Cu concentration of 0.01 ppb or less and does not describe storing a wafer in water with an added chelating solution. Therefore, each reference does not describe the essential features of the present invention, and the claims patentably distinguish over the references in their present form.

Moreover, and as previously noted, because Suzuki et al. specify an aqueous hydrogen peroxide solution of water for storing a wafer, one of ordinary skill in the art would not intend to apply cleaning water containing an Fe concentration of 0.01 ppb or less, or cleaning water with an added chelating agent, as described in Hayashida et al., to the water storage methods described in Suzuki et al. Additionally, because both references do not observe that degradation of oxide

dielectric breakdown voltage occurs due to Cu contained in the storage water, one of ordinary skill in the art would not be lead to combine the water storage methods described in Suzuki et al. with the water containing a chelating agent as described in Hayashida et al., or to apply the combination thereof for preventing contamination of Cu. Accordingly, claims 1, 3, 4 and 12 patentably distinguish over both references.

In particular, and with regard to claims 1, 3 and 4, because the two references do not describe the influence on the oxide dielectric breakdown voltage due to contamination of Cu in the storage water and Cu concentration, even if both references are combined, one of ordinary skill in the art would not be lead to the subject matter of the claims in view thereof.

In applicant's response of May 30, 2001, it is pointed out that the reference does not describe a cleaning solution containing Cu at a concentration of 0.01 ppb or less (see paragraph 7-9 under "Applicant's Arguments" on the sixth and seventh pages of the current Office Action). In this regard, the Examiner asserts that applicant states that the water contains Cu at a concentration of 0.01 ppb or less, and therefore, the Examiner can interpret the concentration of Cu to be at 0. Cu is not an essential limitation, because the range can be from 0 to 0.01 ppb of Cu in water for the storage of silicon wafers (see paragraphs 7-9 under "Response to Applicant's Arguments" on the seventh page of the current Office Action).

While the Examiner can interpret the concentration of Cu to be at 0, it is common technical knowledge that an actual liquid contains some degree of

impurities and the impurity concentration cannot be 0. The lower limit or less of the impurity concentration can be determined by the detection method to be used, but it does not mean that the impurity concentration becomes 0. The present invention involved investigation and examination of the concentration of Cu in storage water, which necessarily contaminates in some measure, and determined that degradation of oxide dielectric breakdown voltage occurs even when the concentration of Cu in the storage solution is 1 ppb or less (see lines 12-15 of page 11 of the specification). As a result, it was found in accordance with the present invention that when the Cu concentration of the storage water is 0.01 ppb or less, degradation of the oxide dielectric breakdown voltage can be significantly decreased (see lines 22-27 of page 11 of the specification). As disclosed by Example 1 and illustrated by Fig. 1 of the present application, the important significance of a Cu concentration of 0.01 ppb or less is clear. Therefore, the features of claims 1 and 4 of the present application, that a Cu concentration of 0.01 ppb or less is essential to the present invention, shows that it is a mischaracterization of the claims of the present invention that Cu is not an essential limitation, because the range can be from 0 to 0.01 ppb of Cu in water for the storage of silicon wafers.

On the contrary, and as described above, neither Hayashida et al. nor Suzuki et al. investigate or discuss a Cu concentration of 0.01 ppb or less, or even a Cu concentration of any value, which is the essential feature of the present invention. That is, it reflects that neither reference measures the Cu concentration and does

not understand the influence thereof. Accordingly, as previously mentioned, one of ordinary skill in the art could not derive the present invention from the references, which do not teach or suggest the influence of Cu concentration on oxide dielectric breakdown voltage.

As previously described, one of ordinary skill in the art could not derive the subject matter of claims 1, 3, 4 and 12 of the present application from the attempted combination of Hayashida et al. and Suzuki et al. Moreover, the present invention has an unexpected effect which is not described in either reference that the degradation of oxide dielectric breakdown voltage of the silicon wafer could be prevented in the case where the silicon wafer is stored in water between production steps.

Therefore, it is again pointed out that claims 1, 3, 4 and 12 patentably distinguish over the references and should be allowable. The remaining claims depend, directly or indirectly, from one of claims 1, 3, 4 and 12, and should also be allowable for the same reasons. Therefore, reconsideration and allowance are respectfully requested.

If for any reason the Examiner finds the application other than in condition for allowance, the Examiner is requested to call the undersigned attorney at the Los Angeles telephone number (213) 337-6846 to discuss the steps necessary for placing the application in condition for allowance.

If there are any fees due in connection with the filing of this response, please charge the fees to our Deposit Account No. 50-1314.

Respectfully submitted,

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